

PATENT APPLICATION

UTILIZATION OF SINGLE RELATIONAL POLYMORPHISMS FOR
DATA ANALYSIS AND TARGETED MARKETING

Inventors: Richard E. Rowe of
Reno, Nevada
United States citizen

Michael Oberberger of
Reno, Nevada
United States citizen

Assignee: International Game Technology

BEYER WEAVER & THOMAS, LLP
P.O. Box 778
Berkeley, California 94704-0778
(510) 843-6200

PATENT

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5 UTILIZATION OF SINGLE RELATIONAL POLYMORPHISMS FOR
DATA ANALYSIS AND TARGETED MARKETING

RELATED APPLICATION DATA

The present application claims priority from U.S. Provisional Patent Application No. 60/266,428 for UTILIZATION OF SINGLE RELATIONAL POLYMORPHISMS FOR 10 DATA ANALYSIS AND TARGETED MARKETING filed on February 2, 2001 (Attorney Docket No. IGT1P048P), the entire disclosure of which is incorporated herein by reference for all purposes.

15 BACKGROUND OF THE INVENTION

The present invention relates to the analysis of player tracking data in the gaming industry. More specifically, the present invention provides techniques for identifying relationships in player tracking data which facilitate more specifically targeting marketing and promotional resources.

20 The management and analysis of data has long been important to many industries. As such many methodologies have been developed over the years that are oriented towards utilizing the relational aspects of collected data and data presentation for a variety of applications. The gaming industry is among those industries where the analysis of collected data is extremely important to optimizing marketing campaigns that directly affect the company's bottom line. Within the gaming industry data are collected as players play games 25 on the casino floor. These data are commonly referred to as player tracking information. This player tracking information is combined together with fundamental player related data

elements such as city/state, age, income, etc., to form player data relationships. Using these player data relationships, casinos can combine the data collected from tracking the game play of specific players and target those players with specific marketing campaigns organized in an attempt to increase revenue for the casino.

5 However, relational databases and the current tools used to mine them are unable to take advantage fully of the richness of the data in the typical player tracking system. In many cases, the amount of data to be mined is extremely large resulting in database queries that take an inordinate amount of time when searching for specific attributes. Given the success of marketing and promotional activities based on such systems to date, there are significant incentives to develop data analysis techniques which can take advantage of this richness and more specifically target marketing and promotional resources while reducing the amount of time traditional relational searches take to mine the data of interest.

SUMMARY OF THE INVENTION

According to the present invention, techniques are provided by which data relationships in a relational database can be more easily identified than through the use of previously available data mining techniques. According to various embodiments of the 5 present invention, one or more differences in a set of attributes and/or attribute relationships associated with individuals or groups of individuals are identified and used to create new optimized groups and data relationships.

Thus, the present invention provides methods and apparatus for analyzing data in a relational database in which a plurality of attributes are stored for each of a plurality of individuals. The plurality of attributes includes at least one attribute relating to gaming behavior associated with the corresponding individual. Selected ones of the plurality of attributes associated with each of a first subset of the individuals are compared with the selected attributes associated with others of the first subset of individuals to determine at least one difference among the plurality of attributes according to which the first subset of individuals may be divided into further subsets of the individuals. Each of the individuals in the first subset has at least one of the plurality of attributes in common.

A further understanding of the nature and advantages of the present invention may be realized by reference to the remaining portions of the specification and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a player tracking system in which various embodiments of the present invention may be practiced.

Fig. 2 is a block diagram of a player tracking unit for use with various embodiments of the present invention.

Fig. 3 is a flowchart illustrating a specific embodiment of the present invention.

Figs. 4A and 4B are diagrams illustrating exemplary relationships between various subgroups of individuals within a group of individuals.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

Player tracking programs are becoming more and more popular in the gaming industry. Such programs have become extremely effective marketing tools for gaming establishments. The programs allow a casino to identify and reward customers based upon their previous game play history. In particular, a goal of the casinos is to identify and then to provide a higher level of service to certain groups of players identified as especially valuable to the casinos. For instance, players that visit the casino, on average, once a week may be deemed as "special" customers and the casino may desire to cultivate a "special" relationship with these customers. Various embodiments of the present invention may be employed to analyze the player tracking data collected by such programs in a more sophisticated manner, thereby making the allocation and targeting of marketing and promotional resources more effective.

Player tracking programs provide rewards to players that typically correspond to the player's level of patronage (e.g., to the player's playing frequency and/or total amount of game plays at a given casino). Player tracking rewards may be free meals, free lodging and/or free entertainment. These rewards may help to sustain a game player's interest in additional game play during a visit to a gaming establishment and may entice a player to visit a gaming establishment to partake in various gaming activities.

In general, player tracking programs may be applied to any game of chance offered at a gaming establishment. In particular, player tracking programs are very popular with players of mechanical slot gaming machines, video slot gaming machines, and table games. In a gaming machine, a player tracking program may be implemented using a player tracking unit associated with the gaming machine and in communication with a player tracking server.

Typically, when a game player wants to play a game on a gaming machine and utilize the player tracking services, a game player inserts a player tracking card, such as a magnetic striped card, into a card reader associated with the gaming machine. After the magnetic striped card has been so inserted, the player tracking unit associated with the machine may detect this event and receive certain identification information contained on the card. For example, a player's name, address, and player tracking account number encoded on the magnetic striped card may be received by the player tracking unit. In general, a player must provide identification information of some type to utilize player tracking services available on a gaming machine. For current player tracking programs, the most common approach for providing identification information is to issue a magnetic-striped card storing the necessary identification information to each player that wishes to participate in a given player tracking program.

It will be understood that the specific systems and mechanisms by which player tracking data may be generated and collected vary widely and are not particularly relevant to the present invention. However, for illustrative purposes, an exemplary player tracking system in which various specific embodiments of the present invention may be implemented will now be described with reference to Figs. 1 and 2. It should be understood at the outset that this player tracking system is described merely for illustrative purposes and that the present invention may be implemented using data generated by any of a wide variety of player tracking systems. Therefore, the scope of the invention should not be limited to the use of data generated by the player tracking system described.

Fig. 1 is a simplified block diagram of a gaming network including a number of gaming machines with player tracking units connected to a server providing player tracking services. In casino 150, gaming machines 100, 101, 102 and 103 are connected via the data collection unit (DCU) 106 to the player tracking/accounting server 120. The DCU 106,

which, in a specific embodiment, may be connected to up to 32 player tracking units as part of a local network, consolidates the information gathered from player tracking units in gaming machines 100, 101, 102 and 103 and forwards the information to the player tracking account server 120. The player tracking account server is designed 1) to store player tracking account information such as information regarding a player's previous game play, and 2) to calculate player tracking points based on a player's game play that may be used as basis for providing rewards to the player.

In gaming machine 100 of casino 150, a player tracking unit 107 and slot machine interface board (SMIB) 105 are mounted within a main cabinet 108 of the gaming machine. A top box 130 is mounted on top of the main cabinet 108 of the gaming machine. In many types of gaming machines, the player tracking unit is mounted within the top box 130. Usually, player tracking units, such as 107, and SMIBs, such as 105, are manufactured as separate units before installation into a gaming machine, such as 100.

The player tracking unit 107 includes three player tracking devices, a card reader 124, a key pad 122, and a display 116, all mounted within the unit. The player tracking devices are used to input player tracking information that is needed to implement the player tracking program. The player tracking devices may be mounted in many different arrangements depending upon design constraints such as accessibility to the player, packaging constraints of a gaming machine and a configuration of a gaming machine. For instance, the player tracking devices may be mounted flush with a vertical surface in an upright gaming machine and may be mounted flush with a horizontal in a table top gaming machine.

The player tracking unit 107 communicates with the player tracking server via the SMIB 105, a main communication board 110, and the data collection unit 106. The SMIB 105 allows the player tracking unit 107 to gather information from the gaming machine 100

such as an amount a player has wagered during a game play session. This information may be used by the player tracking server 120 to calculate player tracking points for the player. The player tracking unit 107 is usually connected to the master gaming controller 104 via a serial connection and communicates with the master gaming controller 104 using a serial communication protocol. The serial connection between the SMIB 105 and the master gaming controller 104 may be through the main communication board 110, through another intermediate device, or through a direct connection to the master gaming controller 104. As an example of a serial communication protocol, the master gaming controller 104 may employ a subset of the Slot Accounting System (SAS protocol) developed by International Game Technology of Reno, Nevada, to communicate with the player tracking unit 107.

Fig. 2 is a block diagram of a player tracking unit for use with various embodiments of the present invention. Player tracking unit 107 is connected to a master gaming controller 104 on a gaming machine and a player tracking server 120. The player tracking unit 107 includes a logic device 210 enclosed in a logic device housing and a number of player tracking interface devices including a card reader 124, a display 116, a key pad 122, a light panel 216, a speaker 209, a microphone 207, a wireless interface 264, and other player tracking interface devices 256 enclosed in a device housing 211. The logic device 210 for the player tracking unit and the player tracking interface devices may be enclosed in a single housing or separate housings.

The logic device 210 may include a processor 202 for executing software allowing the player tracking unit to perform various player tracking functions such as communicating with the player tracking server 120, communicating with the master gaming controller 104, or operating the various peripheral devices such as the card reader 124, the display 116, the key pad 122 and the light panel 216. For instance, the logic device 210 may send messages containing player tracking information to the display 116. As another example, the logic

device 210 may send commands to the light panel 216 to display a particular light pattern and to the speaker 209 to project a sound and convey audible game information. The logic device 210 may utilize a microprocessor and/or microcontrollers. For instance, the light panel 216 may include a microcontroller that converts signals from the processor 202 to voltage levels for one or more illumination devices. In one embodiment, application software for the player tracking unit 107 and configuration information for the player tracking unit may be stored in a memory device such as an EPROM 208, a non-volatile memory, a hard drive, or a flash memory.

The player tracking unit may include a memory 217 configured to store: 1) player tracking software 214 such as data collection software, 2) player tracking communication protocols 221 allowing the player tracking unit 107 to communicate with different types of player tracking servers, 3) device drivers 230 for many types of player tracking interface devices, 4) voice recognition software for receiving voice commands from the microphone 207, and 5) communication transport protocols 240 such as, for example, TCP/IP, USB, Firewire, IEEE 1394, or Bluetooth, allowing the player tracking unit to communicate with devices using these protocols, or allowing the logic device to communicate with different types of master gaming controllers (i.e., master gaming controllers using different types of communication protocols), such as 104. Typically, the master gaming controller, such as 104, communicates using a serial communication protocol. A few examples of serial communication protocols that may be used to communicate with the master gaming controller include but are not limited to USB, RS-232, and Netplex (a proprietary protocol developed by IGT, Reno, Nevada).

A plurality of device drivers 230 may be stored in memory 217 for each type of player tracking device. For example, device drivers for five different types of card readers, six different types of displays, and 8 different types of key pads may be stored in the

memory 217. When one type of a particular peripheral device is exchanged for another type of the particular device, a new device driver may be loaded from the memory 217 by the processor 202 to allow communication with the device. For instance, one type of card reader in the player tracking unit 107 may be replaced with a second type of card reader where

5 device drivers for both card readers are stored in the memory 217.

In some embodiments, the software units stored in the memory 217 may be upgraded as needed. For instance, when the memory 217 is a hard drive, new device drivers or new communication protocols may be uploaded to the memory from the master gaming controller 104, the player tracking server 120, or from some other external device. As another example, when the memory 217 is a CD/DVD drive containing a CD/DVD designed or configured to store the player tracking software 214, the device drivers 230, and other communication protocols 221 and 240, the software stored in the memory may be upgraded by replacing a first CD/DVD with a second CD/DVD. In yet another example, when the memory 217 uses one or more flash memory units designed or configured to store the player tracking software 214, the device drivers 230, and other communication protocols 221 and 240, the software stored in the flash memory units may be upgraded by replacing one or more flash memory units with new flash memory units storing the upgraded software.

In one embodiment of the present invention, a minimal set of player tracking software applications 214, communication protocols 240, player tracking communication protocols 221, and device drivers 230 may be stored in the memory 217. For instance, an operating system, a communication protocol allowing the player tracking unit 107 to communicate with a remote server such as the player tracking server 120 and one or more common player tracking applications may be stored in memory 217. When the player tracking unit is powered-up, the player tracking unit 107 may contact a remote server 120 and download specific player tracking software from the remote software. The downloaded

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software may include but is not limited to one or more particular player tracking applications that are supported by the remote server, particular device drivers, player tracking software upgrades, and a particular communication protocol supported by the remote server.

In some embodiments, the player tracking functions may be implemented by both the logic device 210 and the master gaming controller 104. For instance, the master gaming controller may execute voice recognition software to interpret voice commands input from the microphone 207. Thus, player tracking software such as the player tracking protocols may be stored on a memory located on the gaming machine which is separate from the player tracking unit. In some embodiments, the player tracking software stored in the memory in the gaming machine may be executed by the master gaming controller 104 in the gaming machine. In other embodiments, the player tracking software stored in the memory in the gaming machine may be executed by the logic device 210 in the player tracking unit.

The logic device 210 includes a network interface board 206 configured or designed to allow communication between the player tracking unit 107 and other remote devices such as the player tracking server residing on a local area networks such as a casino area network, a personal area network such as a piconet (e.g., using Bluetooth), or a wide area network such as the Internet. The network interface board 206 may allow wireless or wired communication with the remote devices. The network interface board may be connected to a firewall 212. The firewall may be hardware, software, or combinations of both that prevent illegal access of the gaming machine by an outside entity connected to the gaming machine. The internal firewall is designed to prevent someone such as a hacker from gaining illegal access to the player tracking unit or gaming machine and tampering with it in some manner. For instance, an illegal access may be an attempt to plant a program in the player tracking unit that alters the operation of the gaming machine allowing it to perform an unintended function.

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The communication board 204 may be configured to allow communication between the logic device 210 and the player tracking interface devices including 124, 116, 122, 216, 207, 209, and 256 and to allow communication between the logic device 210 and the master gaming controller 104. The wireless interface 264 may be used to allow the player tracking unit and possibly the master gaming controller 104 to communicate with portable wireless devices or stationary devices using a wireless communication standard. The wireless interface 264 may be connected to an antenna 257. In some embodiments, the wireless interface 264 may be incorporated into the communication board 204. In addition, in some embodiments, the logic device 210 and the master gaming controller 104 may communicate using a non-proprietary standard wireless communication protocol such as Bluetooth or using a non-proprietary standard wired communication protocol such as USB, Firewire, IEEE 1394 and the like. In other embodiments, the logic device 210 and the master gaming controller may communicate using a proprietary communication protocol used by the manufacturer of the gaming machine.

The communication between the player tracking unit 107 and 1) the player tracking interface devices, 2) the master gaming controller 104, 3) the player tracking server 120 and 4) any other external or internal gaming devices may be encrypted. In one embodiment, the logic device 210 may poll the player tracking interface devices for information. For instance, the logic device 210 may poll the card reader 124 to determine when a card has been inserted into the card reader or may poll the key pad 122 to determine when a button key has been depressed. In some embodiments, the player tracking interface devices may contact the logic device 210 when a player tracking event such as a card being inserted into the card reader has occurred.

The logic device 210 may poll the master gaming controller 104 for game usage information. For instance, the logic device 210 may send a message to the master gaming

controller 104 such as "coin-in." The master gaming controller may respond to the "coin-in" message with an amount when credits are registered on the gaming machine.

The logic device 210, using an appropriate device driver, may send instructions to the various player tracking interface devices to perform specific operations. For instance, after a card has been inserted into the card reader 124, the processor logic device may send a "read card" instruction to the card reader, a "display message A" instruction to the display 116, and a "good luck" voice message to speaker 209. In addition, the logic device 210 may be configured to allow the master gaming controller 104 to send instructions to the player tracking interface devices via the logic device 210. As an example, after a card has been inserted into the card reader 124, the processor logic 210 may determine that the card is for a gaming application controlled by the master gaming controller 104 and send a message to the master gaming controller 104 indicating a card has been inserted into the card reader. In response, to the message from the logic device, the master gaming controller 104 may send a series of commands to the player tracking interface devices such as a "read card" instruction to the card reader 124, a flash light pattern "A" command to the light panel 216, and a "display message" instruction to the display 116 via the logic device 210. The instructions from the master gaming controller 104 to the player tracking interface devices may be obtained from gaming application software executed by the master gaming controller 104. The gaming application software may or may not be related to player tracking services.

20 The player tracking unit 107 may include one or more standard peripheral communication connections (not shown). The logic device 210 may be designed or configured to communicate with the master gaming controller 104 and the player tracking interface devices using a standard peripheral connection, such as an USB connector, and using a standard communication protocol, such as USB. The USB standard allows for a number of standard USB connectors that may be used with the present invention. The player

tracking unit 107 may contain a hub connected to the peripheral communication connection and containing a plurality of peripheral communication connections.

The player tracking data generated and collected using the exemplary system of Figs. 1 and 2 may include, for example, each player's name, age, geographical region, gender, 5 income, frequency of play, favorite day to play, favorite time to play, average amount bet, speed of play, total amount played, game preference, entertainment preference, cuisine preference, beverage preference, birth date, etc. It should be noted that this list of attributes is not exclusive and that embodiments of the invention are contemplated which relate to or employ different combinations of these attributes as well as any additional attributes relating to a player's demographic profile or gaming behavior. In addition, the data analysis techniques described herein may be performed by any of a variety of computing systems and devices such as, for example, the player tracking account server 120 of Figs. 1 and 2.

According to an exemplary embodiment represented by the flow chart of Fig. 3, a set of attributes and/or attribute relationships for a single individual which collectively define a sort of "gaming DNA" for the individuals in a player tracking system database are identified 15 (302). The set of attributes and/or attribute relationships which makes up this gaming DNA may be any subset of the attributes stored in the system's player tracking database (examples given above), and any relationships between such attributes, and may vary from analysis to analysis. That is, as will become clear, the set of attributes and/or relationships defining the 20 gaming DNA may be redefined each time the player tracking database is mined according to the techniques of the present invention.

As used herein, the term "attribute relationship" may include relationships of attributes to specific individuals as well as relationships between or among a set of attributes related to the individual. An exemplary set of attributes and some typical values or ranges of 25 values associated therewith are shown in Table I. As noted above, this set of attributes is

merely exemplary and represents a specific subset of all possible attributes which may be tracked in a player tracking system and which may be used to implement the data analysis techniques of the present invention. Similarly, the attribute values and ranges shown are only examples of the values and ranges which may be employed without departing from the scope of the invention.

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Attribute	Value/Range
Age	21-35; 35-45; over 45
Geographical Region	e.g., Washoe County, Carson, Tahoe...
Gender	Male or Female
Income	<25K; 25K-35K; 35K-50K...
Frequency of Play	1-10 times/month; 1 time/week; every day...
Favorite Day to Play	Mon; Tue; Wed; Thu; Fri; Sat; Sun...
Favorite Time to Play	6am-1pm; 1pm-7pm; 7pm-10pm...
Average Amount Bet	\$1; \$5; \$10; \$20; \$50; \$100...
Total Amount Played	\$0-100; \$100-500; \$500-1000...
Game Preference	Little Green Men; Texas Tea; Neon Nights...
Cuisine Preference	Italian; Chinese; Sea Food...
Music Preference	Rock'n'Roll; Blues; Classical; Jazz...

Table I

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Regardless of what attributes values and attribute relationships are used, once the gaming DNA attributes and/or relationships for a particular analysis are selected, a particular value or set of values for one or more of these attributes is used to form a traditional query (304) which is then applied to the player tracking database to retrieve a first subset of the specific individuals represented in the database corresponding to that value or set of values and attribute relationships (306). For example, a query might be formulated to identify all males over the age of 40 who engage in gaming activity at least 10 times per month and

frequently play on Saturday nights. Under traditional marketing or promotional techniques, such a query would typically be formulated into a group with an a priori marketing plan targeted to individuals corresponding to such a demographic. According to the present invention, further relationships in the data may be identified which can facilitate more accurate, efficient, and effective targeting of marketing and promotional resources.

For example, a user may wish to do a query on attribute differences for the group identified above, i.e., all males over the age of 40 who engage in gaming activity at least 10 times per month and frequently play on Saturday nights. As will be described, these attribute differences are then used to create subgroups which may be further evaluated for differences. For example, 90% of the main group may play on 25 cent gaming machines. This forms a subgroup which in turn may form other subgroups based on further differences, e.g., only 5% of the subgroup plays between 2am and 4am.

Fig. 4A illustrates how each player in the main player group has one or more attributes in common (e.g., Attribute Set 1) with all other players in the group, as well as other attributes (e.g., Attribute Sets 2, 3, and 4) which are held in common with only certain other players. That is, distinct subgroups may be identified by such commonalities. However, instead of using traditional queries, the present invention more efficiently identifies such subgroups within the main group and within other subgroups (see Fig. 4B) with reference to the *differences* between the gaming DNA of the players in the main group or subgroup.

Referring back to Fig. 3 and according to a specific embodiment, the gaming DNA of the individuals identified in 306 are analyzed to identify one or more differences by which this first subset of individuals may be further subdivided (308). Each such difference may be referred to herein as a single relational polymorphism or SRP.

The phrase “single relational” represents the attribute relationships that exist for a given individual. The term polymorphism is used in traditional object oriented programming to mean the way in which something is implemented can be changed or extended without effecting the mechanisms that depend on the fact that the action is actually performed. In the 5 field of genetics, Single Nucleotide Polymorphisms (or SNPs) are the different nucleotides detected in a human DNA sequence comprising four nucleotides; compare two sequences, position by position, and wherever you come across different nucleotides at the same position, an SNP has been detected. The phrase “Single Relational Polymorphism” as used herein represents a single relationship of data attributes which is different, or has changed, for an individual or subset of individuals from that set of data attributes that exists for a larger group or superset of individuals.

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Gaming DNA Type 1 Attribute Values	Gaming DNA Type 2 Attribute Values
Male	Male
Over age 40	Over age 40
Play over 10 times/month	Play over 10 times/month
Play on Saturday nights	Play on Saturday nights
Total amount played \$100-\$200	Total amount played \$500-\$600
Chinese food preference	Italian food preference
Rock'n'Roll music preference	Blues music preference

Table II

Both gaming DNA types 1 and 2 share the attribute values of the original query, i.e., males over age 40 who play at least 10 times per month and on Saturday nights. However, there are some key differences, i.e., single relational polymorphisms, which distinguish the individuals corresponding to these profiles in some respects that, as will be discussed, can be significant from a marketing or promotional perspective. For example, the individuals corresponding to the different gaming DNA types differ in the total amount played (\$100-\$200 vs. \$500-\$600), the cuisine preference (Chinese vs. Italian), and the music preference (Rock'n'Roll vs. the Blues). The significance of such differences with regard to the allocation of marketing and promotional resources will become apparent.

It should be noted, that these differences could be identified using the trial and error approach of traditional data mining techniques, e.g., numerous successive queries or sorting by each of the other possible attributes. The inefficiencies inherent in such an approach are manifest. By contrast, the present invention provides a more efficient way to identify these differences by allowing comparison across a specified set of parameters, i.e., the gaming DNA, thus going beyond the relatively limited original query without requiring the hit-and-miss approach.

The marketing or promotional strategy upon which the original query in 304 was based may then be refined based on any of the SRPs identified (310). For example, referring again to Table II, a casino might be inclined to give preferential treatment to customers corresponding to gaming DNA type 2 because of their higher level of patronage. In addition, promotional offerings such as free dinners and shows can be more specifically tailored for each customer, e.g., an Italian dinner or Blues show for type 2 individuals versus a Chinese dinner or a Rock'n'Roll show for a type 1 individual.

While the invention has been particularly shown and described with reference to specific embodiments thereof, it will be understood by those skilled in the art that changes in the form and details of the disclosed embodiments may be made without departing from the spirit or scope of the invention. For example, the techniques of the present invention may be employed to enhance data analysis capabilities for any type of relational database, e.g., consumer and other marketing databases. It should also be understood that, for example, the exemplary embodiment of Fig. 3 is merely presented for illustrative purposes and that not all of the process elements described must be practiced to be within the scope of the invention. That is, for example, the initial query described in 304 and 306 to initially identify a pool of individuals for further processing may not be necessary. Rather, the techniques of the present invention may be applied to a previously defined set of individuals which was not identified using such a query. It should also be understood that the techniques of the present invention may be applied to a relational data set comprising a plurality of player tracking databases corresponding to multiple gaming properties whereby subsets of individuals with at least one common attribute are created from sets of individuals corresponding to more than one of the gaming property databases.

In addition, although various advantages, aspects, and objects of the present invention have been discussed herein with reference to various embodiments, it will be

understood that the scope of the invention should not be limited by reference to such advantages, aspects, and objects. Rather, the scope of the invention should be determined with reference to the appended claims.